A Special Report On The Use Of Water Quality Objectives Under Forest Practices Legislation

Lessons For The Future

Forest Practices Board

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Letter of Introduction

This special report has been prepared under section 189(3) of the Forest Practices Code of British Columbia Act, which permits the chair of the Board to report to the public and to government about issues arising from the Board's work in audits or complaint investigations. It deals with the future regulation of forestry and range practices to protect water quality in community watersheds. However, while government regulation of practices that may impact water quality is extremely important, it is only part of the solution to water quality issues. Just as important is establishing cooperative working relationships between municipal water purveyors and forestry companies.

As an example, such a relationship has been essential to the maintenance of excellent water quality in both Port Alberni and Nanaimo, two cities that rely heavily on intensely logged watersheds. Through ongoing communication, the municipalities bring forward their concerns and the forest companies choose practices that best address those concerns. The relationship depends on scheduled periodic meetings, disclosure of forestry plans and discussion of specific problems. Open communication between companies and the water purveyors ensures emergencies are dealt with efficiently. In Nanaimo, major changes to forestry practices are put before municipal water boards to identify potential concerns. The respected relationship ensures identified concerns are actually addressed. To address water quality problems associated with erosion, Port Alberni's waterworks relies on a specific commitment by forestry companies to cease operations during significant rain events.

As is demonstrated in these two cities, a cooperative relationship between water purveyors and forestry companies ensures the expertise, experience and resources of forest companies benefit municipalities in their effort to maintain high water quality. At the same time, forest companies secure a healthy resource base and enjoy a respected reputation. Accordingly, government should play a role in encouraging licensees and water purveyors to work collaboratively to protect water, in addition to regulation.

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Introduction

This report discusses the history of water quality objectives (WQOs) under the Forest Practices Code (the Code) and other legislation in BC and elsewhere, the usefulness of WQOs as an enforceable regulatory standard, and possible lessons for the future.

Understanding the role of WQOs in the regulatory regime is important, because it appears that BC forest practices legislation in the future may rely more heavily on WQOs and less on prescriptive rules to protect water from forestry and range impacts.

The report concludes that WQOs have value in resource management and long-term sustainability planning. However, they do not constitute an enforceable regulatory standard. They cannot replace adequate regulations to assess risks and prevent damage to water quality from forest and range practices.

Background

Protection of water quality in community watersheds will be an important issue under the new *Forest and Range Practices Act*.

Forest and range practices can affect water quality in a number of different ways. Road construction and use, and forest harvesting, can increase the runoff of sediment into waterbodies and destabilize stream banks. Forest practices can also affect levels of pesticides, nutrients and organic matter, and can alter water temperature and flow. Range use can increase fecal coliform levels, increase erosion and destabilize streambanks.

Even surface water in its natural state needs to be treated before use, but turbidity from forest and range practices can make treatment ineffective. Over time, it can contribute to the need for very expensive filtration equipment. The auditor general estimated that adding filtration systems to municipalities outside of Vancouver and Victoria would cost $700 million in capital costs and $30 million annually.

Community watersheds and the Forest Practices Code

Community watersheds supply water for human consumption through a licensed waterworks or a water users' community.[1] In BC, there are approximately 465 watersheds that have community watershed designation under the Forest Practices Code, representing approximately 1.5 percent of the area of the province. Community watersheds supply water to large communities as well as to small settlements.

Most community watersheds are located in the provincial forest, and this often raises the question of how to integrate forestry/range use with domestic water use.

In 1995 the *Forest Practices Code of British Columbia Act* established certain requirements to protect community watersheds from possible negative impacts from forestry. Among other things, it required terrain mapping, terrain stability field assessments, and watershed and erosion assessments; it established minimum buffers around streams when applying pesticides and fertilizers; and it provided for riparian buffer zones during harvest. It also set range practices requirements.

The Forest Practices Code also called for the establishment of WQOs for community watersheds, and prohibited activity that would degrade water, causing it to fail to meet the objectives. The following water quality provisions applied:[ii]

- Section 7(8) of the *Timber Harvesting Practices Regulation* prohibited timber harvesting in a community watershed that would cause the water quality to fall below *known water quality objectives*.

- Section 11(7) of the *Forest Road Regulation* (FRR) prohibited depositing slash, debris or erodible soil in or near waterbodies, if the deposit could cause water to fail to meet its *known water quality objectives*.

- Section 12(6) of the FRR required that a person constructing or modifying roads in a community watershed must ensure the activity does not cause the water to fail to meet *known water quality objectives*.

- Section 18(4) of the FRR stated that road maintenance in a community watershed must not cause water quality to fail to meet *water quality objectives*.

- Section 20(1) of the FRR required that deactivation works in community watersheds must not cause the water to fail to meet *known water quality objectives*.

- Section 7(1) of the *Range Practices Regulation* required the exclusion of cattle from a community watershed if the cattle caused the water to fail to meet the *water quality objectives*.

- Section 21(2) of the *Silviculture Practices Regulation* directed that a person carrying out silviculture treatments and applying fertilizer must not cause water to fall below *known water quality objectives*.

- In addition, the *Operational Planning Regulation* (OPR) required *water quality objectives* to be reflected in a variety of plans.

Thus, it was intended that these objectives would be a regulatory standard that could be enforced.

However, under the Forest Practices Code, there was a whole suite of other regulatory measures, including assessment requirements and detailed practice rules, to supplement the regulatory role of WQOs. For enforcement purposes, WQOs were a backup measure—they were not intended to stand on their own as an enforcement tool.

Water Quality Objectives

Water quality objectives are environmental benchmarks that set out the safe levels of substances for the protection of the most sensitive water use at a specific location. Objectives can include such criteria as turbidity levels, levels of fecal coliform, pesticides, organic matter, nitrate/nitrite concentrations, temperature and stream flow.

Because water quality varies between different watersheds, objectives are set for each watershed. Objectives are based on levels set in the provincial *Water Quality Guidelines*, adjusted to take into account local conditions that may influence the negative effects of the particular substances.

WQOs have been used in British Columbia as a management tool since the early 1980s. The Ministry of Environment initiated them in response to a 1981 Auditor General's report that recommended the ministry develop a way to measure its performance in safeguarding water quality.

The future role of water quality objectives

In implementing a results-based forest practices regime, government has indicated that it may rely more heavily on water quality objectives than it did under the Forest Practices Code. WQOs for community watersheds are classic "results" parameters—they tell you the specific goal that you want to accomplish, and don't prescribe how to accomplish the end result.

Government plans to complete work on establishing WQOs for a number of community watersheds over the next two years. A results-based *Forest and Range Practices Act* has been enacted, and regulations are under development. Section 149 of the new *Forest and Range Practices Act* authorizes Cabinet to set objectives, and section 5(2)(v) indicates that objectives will be set for water.

While regulations have not been finalized, proposals have been made to rely more on the requirement that licensees achieve the result of maintaining community watershed objectives—perhaps at the expense of having fewer prescribed requirements for such things as terrain mapping, terrain stability field assessments, erosion assessments, watershed assessments and forest practices rules.

It appears that consideration is being given to making WQOs a primary regulatory/enforcement standard.

However, a number of experts and government staff most conversant with the issues have raised a concern about the suitability of replacing certain prescriptive rules with a general requirement to not cause a violation of WQOs.

The Board's Involvement with Water Quality Issues

The Board's background with water issues

The Forest Practices Board has conducted a number of investigations and administrative review/appeal cases dealing with water quality issues. The Board has investigated 13 public complaints about the impact of forestry and range practices on domestic water, including individual and community water supplies.[iii] In addition, it has investigated four complaints about impacts on water quality in Code-designated community watersheds.[iv]

The Board has reviewed a penalty determination made for degradation of a lodge's water supply, on the basis that a substantial penalty should be imposed.[v] It has also appealed a forest development plan in the Queen Charlotte Islands on the basis that a coastal watershed assessment had not been done properly.[vi]

The Board also produced a special report titled *Effects of Cattle Grazing near Streams, Lakes and Wetlands*.

The case that triggered this report

In the course of a recent Board complaint investigation and request for an administrative review, a citizen complained to the Board about the lack of WQOs in a community watershed frequented by cattle. Although the Code clearly required removal of cattle from such a watershed if the cattle caused water to fail to meet water quality objectives, the Board discovered that no objectives had actually been set for the watershed.

Furthermore, the Board discovered that this was not unusual—virtually no community watershed had yet established water quality objectives. Without such objectives, all the Code provisions that prohibit activities that would breach the objectives had no legal effect.

This case prompted the Board to inquire into the progress that has been made in developing WQOs to protect water quality in community watersheds under the Forest Practices Code.

The WQO requirements have been in effect since the inception of the Code in 1995, and substantial resources have been dedicated to establishing WQOs. Yet, after nearly seven years of Code implementation, WQOs for community watersheds have only been established under the Code in one watershed (Keremeos Creek) out of 465 community watersheds.[vii]

It has been estimated that over the next two years, close to 40 more watersheds may have their WQOs completed, if funding is continued. This would still leave over 400 watersheds without finalized WQOs.

This delay in establishing WQOs is a concern that is discussed in Appendix A of this report. However, in the process of looking into the issue, and in considering the plans to increasingly emphasize results-based objectives, the Board became concerned about a more fundamental issue.

The Board is concerned that WQOs have limited usefulness as an enforceable regulatory standard. They cannot replace adequate regulations to assess risks and prevent damage to water quality.

Enforceability of Quality Objectives as a Standard

WQOs have limited usefulness as an enforceable regulatory standard. The problems with using objectives as a regulatory standard include the following:

- WQOs are not well suited for routine enforcement in the specific forestry context because it is difficult to prove that a specific forest practice caused a particular violation of an objective in a waterbody.
- It is questionable whether WQOs can be adequately monitored and enforced.
- It can take a long time for results to appear, and then it may be too late to do anything to avoid problems, remediate them, or even enforce the law.

These issues are discussed below.

Water quality objectives are not well suited for enforcement in the forestry context

WQOs are not generally well-suited to be enforceable regulatory standards. As a Water Quality Branch official stated in 1992:

> [WQOs] are not directly enforced because of the practical difficulties of: 1) accurately measuring contaminants in receiving waters, 2) discerning between anthropogenic input and natural variability, and 3) attributing contamination which exceeds an objective to particular sources for legal purposes.[viii]

A number of government officials involved in developing WQOs have acknowledged that WQOs may not, indeed, be enforceable in the forestry context.

The Board has been unable to discover any jurisdiction where WQOs are used as a primary enforcement standard for forest practices. In certain U.S. states, companies can be prosecuted if they breach both objectives and prescribed best management practices—but if they have followed the prescribed practices, they cannot be prosecuted for violating the objectives alone. Objectives are primarily used to determine if the state government should alter its best management practices rules, to identify quality problems, track trends, and to make resource management decisions.

In submissions to Dr. Hoberg about the results-based code discussion paper, seven government geomorphologists/hydrologists questioned whether the results-based approach to water would adequately protect water resources. They pointed out the problem of enforcing objectives when natural processes themselves can cause objectives to be breached.

Forestry is different than point-source toxin control, where the toxin can more easily be traced back to the one source producing the toxin (e.g., the effluent pipe). A private sector hydrologist/geomorphologist pointed out to Dr. Hoberg that most forest/range practice impacts on water quality are dispersed over the landscape, and:

> The effects of such dispersed sources on water quality are very difficult to measure: the sources are widely distributed and often individually minor; their rates of delivery of deleterious substances (such as sediment, nutrients, or bacteria) are highly variable through time; long-duration and intensive sampling is required to characterize existing water quality conditions; and there are normally no or inadequate data concerning pre-disturbance conditions against which impacts can be compared.[ix]

Forestry can increase turbidity, nutrients, and can change water temperature—but so can nature. In forestry it is extremely difficult to separate forestry effects from natural variation.

In response to proposals for a results-based approach to water quality and other parameters, Dan Moore, the chair of forest hydrology at UBC stated:

> My most fundamental criticism of the proposed approach is that it will be difficult if not impossible to determine whether "results" related to hydrology, water quality and hydroriparian habitat were or were not achieved…
>
> There are four problems with this stated result: (1) it is not always obvious how best to quantify a specific environmental attribute such as water quality, (2) specifying the "natural range of variability" of an attribute in any specific case may be so difficult as to be practicably impossible, (3) determining whether forest development has pushed conditions outside that range may also be so difficult as to be impossible in most cases, and (4) maintaining conditions within the natural range of variability is a necessary, but not sufficient, criterion for protecting against adverse impacts.

> *Given these difficulties in establishing whether or not results were achieved, it is highly unlikely that a licensee could ever be proven not to have achieved the specified results, at least in terms that would stand up under scientific or legal scrutiny. The results would, then, be fundamentally unenforceable in many cases, contrary to the basic premise of results-based management...*[x]
>
> [emphasis added]

It will be extremely difficult to prove that logging activity caused any specific breach of a set objective. The basic problem is that it will be difficult to prove that the pollution levels are not natural.

As pointed out by Professor Moore, specifying the natural variation of water quality "may be so difficult as to be practically impossible." Thus, objectives which aim to reflect natural variation may not be accurate. Therefore, anyone charged with causing the objectives to be breached could argue that the levels of contaminants exceeded the WQOs only because the WQOs were inaccurate—that the objectives were based on original sampling data that missed the naturally high levels of the substance in question. It could be argued that the newly measured levels were not caused by forestry, but by nature.

An example illustrates the problem. In one Okanagan community watershed, objectives for turbidity have been proposed based on about 10 to 15 discrete samples collected each year for three years. The highest observed turbidity value for the three-year period was chosen as the turbidity objective. However, that value was much lower than turbidity values that have been recorded in the past during short, high-turbidity events. It is estimated by a consultant familiar with the watershed that the objective could be exceeded 10 to 20 times per year, primarily due to natural erosion.

Enforcing the objective would mean that a licensee could be held responsible up to 20 times per year for turbidity events that were largely natural. Those charged with breaching any objective in the province could cite this example, and argue that the objective they breached was similarly faulty.

On the other hand, if the sampling for setting objectives had chanced to measure historically high turbidity levels and established them as objectives, even very poor forest practices might not cause a violation.[xi]

Monitoring and enforcement of WQOs

It is questionable whether WQOs can be adequately monitored and enforced. In addition, it is questionable whether there are sufficient staff and resources to meaningfully monitor and enforce WQOs in community watersheds across the province.

Monitoring ever-changing quality in a water body is far more complex than measuring other "results." For example, it is far more challenging to do this than to measure the amount of soil disturbance in a cutblock.

The fundamental problem is that it is more complex to monitor effects on watersheds, and the environment at large (i.e., attainment of WQOs), than just monitoring practices and procedures in and around a logging site.

Oftentimes, water quality is affected by a discrete event (e.g., a landslide) that decreases water quality for a short period of time. If monitoring is not continuous, these fleeting spikes in substandard quality are missed. For instance, in the Board's special investigation, *Forest Practices and Planning in the Sustut Valley North of Smithers, BC*, Ministry of Environment staff observed sediment going into the Sustut River in October 1996, but Board staff did not observe this in May 1997. Enforcement cannot occur for temporary changes in water quality unless these are observed and documented.

In addition, unless comprehensive sampling is done, government may find it difficult to statistically prove that the WQOs have been breached, because actual water quality varies greatly from location to location in a watershed, and it varies greatly over time.

In many cases, companies will be able to argue that the limited sampling that was done falls short of *proving* that water quality in the watershed actually violates the set objectives. They could argue that the limited sampling does not represent a statistically significant temporal and geographic distribution of the watershed—the results could be biased because the sampling was not comprehensive.

Government officials and outside experts have noted that government does not have the capacity to adequately monitor or enforce these objectives. This view is supported by the fact that government plans to monitor only a portion of all community watersheds in any particular year.

Yet, a failure to effectively monitor and enforce WQOs could have profound impacts on the enforcement of water quality, and in public confidence in the new *Forest and Range Practices Act*. A UBC professor has pointed out:

> If you have a poor monitoring program and no enforcement you can't expect that anybody is going to take the water quality objectives into serious consideration... What we need is a monitoring program that is effective...It is nice to have regulations, but if you have no or poor monitoring then the regulations become meaningless.[xii]

Detection of problems in advance

A number of people have pointed out that a WQO-based system only detects problems in a watershed once they affect water—typically not until the damage has been done. For example,

the problem of violating the water quality objective only becomes apparent after the landslide has gone into the creek.

A number of scientists have expressed concern about the fact that measuring results doesn't prevent damage. Water quality impacts can persist for decades after an erosion event has occurred.

Damaging results to water may only become apparent long after the event. As the auditor general pointed out in his report on drinking water, an error in road construction could over-stress a slope, which could slide in the next rainy season. Only then would the problem be detected by water-quality monitoring showing increased turbidity. Monitoring the slope conditions could have resulted in early warning of the problem, and the slide might have been avoided.[xiii]

The chair of forest hydrology at UBC has pointed out an additional difficulty with waiting for results before enforcing the law. Some problems caused by logging (e.g., rotting of roots leading to landslides, woody debris affecting channel form) may take decades to show up. By the time those water quality results have become apparent, enforcement may not be possible—the evidence may be gone.

Waiting for bad results to occur before taking action may not deter bad forest practices—especially if the results manifest themselves so late that responsible parties are not held accountable. Such an approach may not provide the credible enforcement that is necessary to deter damaging forest practices.

Conclusion

As the chair of forest hydrology has noted, given the difficulties in establishing whether or not results such as objectives are achieved, it is highly unlikely that a licensee could ever be proven not to have achieved the specified results, at least in terms that would stand up under scientific or legal scrutiny. The results would then be fundamentally unenforceable in many cases, contrary to the basic premise of results-based management.

Some officials feel that the effectiveness of using objectives as a regulatory standard will be strengthened by the fact that licensees/operators will have to show due diligence in order defend an allegation of contravention.

However, if the chance of government actually proving a contravention is quite remote, there will be little incentive to exercise due diligence. If the chance of a contravention finding is very remote, companies will have lit.'e incentive to spend money exercising due diligence.

WQOs are a highly useful tool for setting water-quality goals, measuring water-quality trends, evaluating the effectiveness of the regulatory regime, and guiding future resource management

decisions (see Appendix A). However, they cannot replace effective and enforceable regulations.

Recommendations

The Board recommends that, in developing the regulations for the *Forest and Range Practices Act*, government should not rely solely on water quality objectives to replace adequate regulations to assess risks and prevent damage to water quality resulting from forest and range practices.

Because of the difficulty in enforcing water quality objectives, there will continue to be a need for certain assessments and prescriptive measures in community watersheds. Government should consider the use of more easily measured intermediate results, such as a prohibition against introducing excessive sediment or deleterious substances into streams. In addition, requirements to follow defined best management practices for critical forest practices around streams and requirements for hazard assessments in forest stewardship plans for community watersheds are warranted.

In particular, government should develop a mechanism to ensure that information about terrain stability and erosion potential is incorporated into logging plans for community watersheds.

When implemented, the *Drinking Water Protection Act* would enable authorities to require a drinking water protection plan, and assessments of risks to source water. Under either that act, or the *Forest and Range Practices Act*, a way should be found to ensure that information about erosion hazards is incorporated into logging plans for community watersheds. There may be total cost savings if the assessments under the *Drinking Water Protection Act* and the *Forest and Range Practices Act* are conducted together.

Appendix A

What is the appropriate use of WQOs?

Historically, objectives have played a useful role as a resource management tool in BC and elsewhere. They have been useful for:

- setting a long-term goal for water quality
- providing a yardstick for long-term tracking of water quality trends. Comparing monitored results with the objectives can highlight developing quality problems.
- use as an effectiveness evaluation tool—they can be an indicator of whether the overall regulatory regime is working (Under the U.S. *Clean Water Act*, comparing water quality with established objectives is commonly used to determine if the best management practices for forestry are actually working to protect water quality. Thus, objectives can be used to measure if other rules are working.)
- providing policy direction for resource managers and the public to determine whether new development fits long-term water goals, and whether it should be permitted.

However, it has been complex and time-consuming to establish and monitor WQOs. Since 1995, water quality objectives have only been set for one watershed (Keremeos Creek), with another 40 anticipated over the next two years.

Gathering a meaningful set of water samples took approximately three years. This was considered to be the minimum period of sampling needed to establish a baseline. Additional time was taken in preparing analyses and reports, and collecting input from government and stakeholders.

It has also cost money. The average cost of establishing WQOs for a single watershed has been approximately $60,000 to $90,000, including data collection, report preparation and review. Funding for data collection came from Forest Renewal BC, and that funding is no longer forthcoming. Officials involved have estimated that it will cost $15 million dollars over the next 10 years to complete the work of setting objectives for all community watersheds. Officials point out, though, that some of this money would have to be spent anyway, to conduct water quality assessments and gather baseline data for other purposes.

There have also been technical problems. For example, the unreliability of automatic turbidity instruments caused problems in some cases.

However, the challenges in establishing WQOs do not detract from the fact that setting objectives is an important component of long-term sustainability planning. They are important

in setting a long-term direction for resource planning, tracking progress, and providing information about changes that need to be made in management and regulations.

Endnotes

[i] See section 41(8)-(10) of the *Forest Practices Code of British Columbia Act*.

[ii] Section numbers cited refer to the regulations existing up to December 12, 2002.

[iii] Complaint Investigation 020396—Water quality in Tindill Creek near McBride in the Robson Valley

Complaint Investigation 010357—Management of water resources at the southwest end of Bonaparte Lake near Kamloops

Complaint Investigation 010291—Water Quality in the July Creek Watershed

Complaint Investigation 010348—Cattle Grazing near Noke Creek

Complaint Investigation 000249 —Did Construction of Road 200 in the Hasty Creek Watershed Meet Forest Practices Code Requirements?

Complaint Investigation 950083 —Slocan Valley Watershed Assessment

Complaint Investigation 990235 —Potential Effects of Logging on Drinking Water Quality at Scum Lake

Complaint Investigation 980154 —Water Quality in the East Blackpool Watersheds

Complaint Investigation 970127 —Protection of Water Quality and Scenic Values from effects of Logging at Gun Lake

Complaint Investigation 980158 —Effects of Power Line Clearing on Domestic Water Supply Near Thutade Lake in Northern B.C.

Complaint Investigation 970131 —Watershed Assessments for Little Cayuse Creek, Near Castlegar, BC

Complaint Investigation 980149 —Hasty/ Aylwin Watershed: A request for community watershed status under the Code

Complaint Investigation 950067 and 950069 —Adequacy of the Public Review and Comment Period for Forest Development Plans in the Slocan Valley

[iv] Complaint Investigation 020398 —Road Failures on Vedder Mountain near Chilliwack

Complaint Investigation 010353—Cattle Grazing in a Community Watershed near Salmon Arm

Complaint Investigation 010320 —Water Quality in the Shawinagan Lake Community Watershed

Complaint Investigation 010306 —Visual Quality and Water Resource Management in the Mission Creek Community Watershed

[v] See Board website, Review and Appeals, file #2000-09, Forest Practices Board v. Ministry of Forests and Royal Oak Mines.

[vi] See Board website, Review and Appeals, file #1999-11, Forest Practices Board v. Ministry of Forests and Husby Forest Products Ltd.

[vii] Water quality objectives had been established in Holland Creek and Stocking Lake prior to the requirement that objectives be made known, and had also been in place in Hydraulic Creek since 1990. Objectives were also established prior to 1995 in several other water bodies, but the focus of these had been non-forestry activities located outside the community watershed areas for those water bodies.

[viii] MELP—BC, "Lower Columbia River—Hugh Keenley Dam to Birchbank—Water Quality Assessment and Objectives: Technical Appendix. August 1992 p. 99-100.

[ix] Sandy Hart, P. Geo., Comments on the RBC Discussion Paper, June 28th, 2002

[x]Dr. R.D. (Dan) Moore, P. Geo., Associate Professor, Dept. of Geography and Forest Resources Management, chair or forest hydrology, UBC, Comments on "A Results-Based Forest and Range Practices Regime for British Columbia: Discussion paper for public review and comment, June 30, 2002.

[xi] Hugh Hamilton, Summit Environmental Consultants Ltd., personal communication.

[xii] Hans Schreier— Sept 26, 2002, personal communication.

[xiii] Auditor General of BC "Protecting Drinking Water Sources" 1998/99 Report #5 P. 69

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